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ABSTRACT

A discussion of pharyngeal fricatives in Arabic looks at voiced and voiceless varieties within the context of K. L. Pike's classifications. Pike treated pharyngeal fricatives as standing apart from others, including a number of oral fricatives and one glottal fricative in a category he called "frictionals." Later, however, he distinguished the categories of fricatives and resonants differently, and reclassified pharyngeal fricatives as resonant orals. Having categorized pharyngeal fricatives as both frictional and resonant, he led to their also being categorized as pharyngeal vocoids rather than contoids. Pike's separation of pharyngeal fricatives from the other lingual fricatives is criticized as resulting from inconsistency in the definition of the oral cavities used in articulation. An alternative analysis is offered. A 14-item bibliography is included. (MSE)

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PHARYNGEAL FRICATIVES, AND PIKE'S 'FRICATIVE' AND 'FRICTIONAL' CATEGORIES

R. K. Sprigg

Carnochan is best known for his contribution to the phonetics and phonology of African languages, Igbo, Hausa, Bachama, and others — he once reported his return to London from study leave in Nigeria to Firth by telephone with the words 'Mr. Chan of Kano speaking' — but it should not be forgotten that he also taught the phonetics of Arabic, and even devised and recorded a new course for that purpose. Since the time of Sweet 'the Arabic throat sounds' (Sweet 1895, 1904, 1906; Henderson 1971, 121–6), including pharyngeal fricatives, have attracted attention as a noteworthy feature of Arabic phonetics; so it is not unreasonable that I should offer my reflexions on the pair of pharyngeal fricatives, voiced and voiceless ([ʕ ħ]), as a tribute to my former colleague and friend of forty-seven years' standing.[1]

1 'Fricative' and 'frictional'; 'contoid' and 'vocoid'

At a very early stage in my study of phonetics I learnt, from the chart of The International Phonetic Alphabet, that the pharyngeal

[1] I have treated [ħ] and [ʕ] as a voiceless and voiced pair of fricatives, as in the I.P.A. chart, but Catford 1977 suggests that in Arabic they may have also been differentiated by place of articulation at an earlier stage of the language (163–4).

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fricatives, [ħ ʕ], belonged to a set of 'fricative consonants' that included such other pairs of fricatives — oral fricatives — as uvular ([χ ʁ]), dental ([θ ð]), labio-dental ([f v]), and bilabial ([ɸ β]), and [ɦ] and [h] too, as 'glottal fricatives', though I no longer accept these two fricatives as phonetically comparable with the remaining pairs (Sprigg 1978, 6–7, 8, 9–10, 12–15, 16);[2] so it was disconcerting to find, later in my training in phonetics, that Pike 1943 did not admit pharyngeal fricatives into his 'fricative' category, in company with such oral fricatives as [χ ʁ ɸ β]: an apprentice phonetician does not welcome disagreement among the authorities in the discipline.

Pike does, however, group the pharyngeal fricatives with all the same fricatives as are shown as such in the I.P.A. chart, apart from [h], in a category that he terms 'frictional', using as his criterion 'local friction at any point' for distinguishing 'frictionals', '(e.g. [s], [f], whispered vocoids, fricative [l], "voiced [h]")', from 'non-frictionals (or frictionless sounds, or sounds with cavity friction only)', '(e.g. [m], [o], [h], frictionless [l])' (140); by this criterion the pharyngeal fricatives [ħ] and [ʕ] are classed as 'frictionals' together with such oral fricatives as [χ ʁ θ ð f v ɸ β], and together with the glottal fricative [ɦ] (but not with the 'cavity fricative' [h]).

'Fricative' versus 'resonant'. At a later stage in his analysis, however, in the course of distinguishing two further categories, 'fricatives' and 'resonants', Pike excludes pharyngeal fricatives from his category of 'fricative orals', '(e.g. [f], [s])', and assigns them to his category of 'resonant orals', '(e.g. whispered [a], timbres of "voiced [h]")', together with such 'non-frictional continuants' as [o] and [l]. In this way the pharyngeal fricatives of the I.P.A. chart, [ħ] and

[2]The International Phonetic Alphabet (revised to 1979) shows only one relevant change from the 1947 scheme: [ɹ] has been removed from the 'Fricative' row, but continues to appear in the 'Frictionless Continuants and Semi-Vowels' row, newly named '(Median) Approximant', together with [ʋ ɻ j ɰ w̥ w]; for a phonetic description of the Lhasa dialect of Tibetan, however, a pair of post-alveolar fricatives [ɹ̝ ɹ̞], is still needed.

[ʕ], and the laryngeal (and therefore glottal) fricatives [ɦ] and [ɦ̥] (corresponding to Pike's [ɦ] and [W], for 'whisper'; 142) are classed together as 'frictional' and 'resonant' but non-'fricative': 'frictionalized resonant orals include the following: whispered vocoids and whispered frictionless laterals; vocoids and frictionless laterals with voiced glottal local friction; vocoids and frictionless laterals with *voiced or voiceless pharyngeal local friction*. . . . Frictionalised nasals include nasals with *any type of pharyngeal local friction*' (Pike 1943, 142)[3] [the emphasis is mine]. In phonetic symbolization, using [V] for any type of syllabic vowel, these 'frictionalized resonant orals' are [V V̥ V̈ V̥̈ I I̥ Ï Ï̥ ʜ ʕ ɦ͡ɪ ʕ͡ɪ ɦ̥͡ɪ ʕ̥͡ɪ]; and, using [N] for all types of nasal consonant, the 'frictionalized resonant nasals' are: [N N̥ N̈ N̥̈ ɦ͡N ʕ͡N].

Pharyngeal 'vocoids'. Before questioning Pike's having classified the pharyngeal fricatives, [ʜ] and [ʕ], as non-'fricative' I ought first to mention that his having classified them as 'frictional' and 'resonant' leads to their also being classified as 'vocoid', as pharyngeal 'vocoids', rather than as 'contoid': 'The sounds which as a group function most frequently as syllabics are vocoids.[4] Phonetically they comprise the

[3] I have pressed [ɦ̥] into service to symbolize *voiceless* glottal (arytenoid) friction (Sprigg 1978, 12), for the distinction between strong whisper (arytenoid) and weak whisper (approximated) see Sprigg 1978 (10, 12), and cf. Sweet 1906, 10.

[4] I find this sentence ambiguous: at first sight it appeared to me to be a definition of 'vocoids' as 'the sounds which, as a group, function most frequently as syllabics', in which case it immediately conflicts with the classification of the sounds '[ɹ], [w], and [ɣ]' (I.P.A. [ɹ], [w], and [j]) as vocoids later in the same paragraph, since they *never* function as syllabics; the context, however, suggests that this sentence should be understood not as a definition but as an observation: it is the vocoids, not the contoids, that, as a group, function *most frequently* as syllabics. This statement does not prevent a sub-class of vocoid, containing [ɹ], [w] and [j], from being, by definition, non-syllabic. Nor does it prevent a small

central resonant orals as already defined. Vocoids include practically all sounds which are usually called "vowels" (whether voiced, voiceless, or whispered), except that "fricative vowels" are excluded, while "vowel glides" such as |r|, |w| and |y| are included' (143). Classifying |ɦ| and |ʕ| as 'vocoids' conflicts with the I.P.A. classification, in which they are shown as 'consonants'.[5]

2 The 'pharyngeal cavity' and the glottis

I have no difficulty in accepting Pike's classification of the *glottal* (and, therefore, laryngeal) fricatives '|ɦ|' and '|W|' (or |ɦ̥|) as 'frictional' and 'resonant', and, therefore, as 'vocoid';[6] but, in separating the *pharyngeal* fricatives |ħ| and |ʕ| from the other *lingual* fricatives |χ ɣ θ ð|, etc., he seems to me to have mis-classified them. |ħ| and |ʕ| owe their classification as 'resonant', not 'fricative' (142), to a combination of two factors: (2.1) Pike's having distinguished the pharynx, or throat, from the mouth, or 'oral cavity', with the status of a

sub-category of contoid from being syllabic on occasions: 'resonant nasals and lateral resonant orals comprise a group of contoid sounds that are often syllabic, but by no means so often as vocoids' (143).

I used to classify |ɦ| with [ɹ], |w|, and |j| as invariably non-syllabic until I found an instance of it as syllabic in the pronunciation of the Japanese word *hite* as '[ɦi̥te]' in Sawashima 1971 (11); Sawashima agreed with me that the wide aperture between the vocal cords in his accompanying fiber-optiscope frames for this syllabic vowel, '[i̥]', was appropriate to a (voiceless) breathed vowel, |hⁱ| (or [ḥ]) not to a (voiceless) whispered vowel, [ɦ̥], hence I was obliged to revise my opinion about a possible syllabic function for |ɦ/ḥ|.

[5]Pike's vocoid category and the I.P.A. chart's vowel category are in close agreement except that Pike's sub-category of vocoids '|r|, |w|, and |y|' (143) are classed as consonants, '(Median) Approximant', [ɹ w j], in the I.P.A. chart 'revised to 1979'.

[6]For |ɦ̥| see note 3.

separate 'cavity', in a set of five 'cavities': oral, nasal, pharyngeal, pulmonic, and oesophageal; and (2.2) his having included the larynx (or, at least, the glottis and that part of the larynx which lies above the glottis) in the 'pharyngeal cavity': 'it does not seem expedient to attempt to work with a classification which would separate the laryngeal and pharyngeal cavities' (85–6). If the pharynx were to be treated as part of the 'oral cavity', or if the larynx were to be treated as part of the 'pulmonic cavity', or given the status of a separate, and sixth, cavity (or if the 'cavity' concept were to be given up), what I see as a mis-classification of the pharyngeal fricatives would not arise; so it is worth while seeing how strong the case is for the two factors that have determined Pike's classification.

2.1 Delimiting the 'pharyngeal cavity'.

The 'pharyngeal cavity' is not easy to delimit physiologically: Pike supports his diagram 'Fig. 1 Cavities' (85) with such specifications as glottal closure and oesophageal closure, 'contained within the pharyngeal cavity at its lower limit', a velar (or uvular) closure, lying outside the pharyngeal cavity, at the point where it meets the oral cavity, and a 'velic' closure, also lying outside the pharyngeal cavity, at the point where it meets the nasal cavity (1943, 85–6). When any of these four closures is in position, therefore, the appropriate limit of the pharyngeal cavity is, admittedly, clear. Thus, during glottal-stop and glottal-plosive articulations, and during ejective and injective articulations, [ʔ k' k͡ʃ], the lower limit of the pharyngeal cavity is clearly defined[7]; otherwise, it merges with the sub-glottal part of the larynx in a single pharyngeo-pulmonic chamber.

Since the glottis, even when fully open, is a relatively narrow channel, the lower limit of the pharyngeal cavity is more easy to determine than its upper limits.

[7]For the term 'injective' see Sprigg 1978, 8; but Catford's terms 'glottalic pressure and suction stops', e.g. [k' k'͡] (Catford 1977, 71) are equally systematic, if not more so.

At its upper extremity the pharyngeal cavity can be clearly delimited, physiologically, from the oral cavity during velar articulations, whether plosive, nasal, or click, [k g ŋ ʘ ʒ ɔ ʗ], by a dorso-velar barrier; but, in the absence of this barrier, the pharyngeal cavity merges imperceptibly with the oral cavity in a unitary pharyngeo-oral air chamber (well illustrated by the vowel diagrams in Ladefoged 1962, 96–7; cf. also Catford 1977, 58). At its upper extremity, again, the pharyngeal cavity can also be physiologically delimited from the nasal cavity by the velum in contact with the naso-pharynx during plosive articulations, oral vocalic articulations, and oral, fricative, lateral, and rolled articulations, e.g. [p b V h j Φ s ɦ l r] (but not during *naso-oral* vocalic, fricative, lateral, and rolled articulations; e.g. [Ṽ h̃ s̃ l̃ r̃]); otherwise, the pharyngeal cavity merges imperceptibly with the nasal cavity in a single pharyngeo-nasal air chamber.

In fact it is only during velar ejective and injective articulations, and articulations with velar-and-glottal double plosion, [k' k$^{\varsigma}$ k͡ʔ], that the pharyngeal cavity can be said to be fully delimited physiologically by Pike's criteria from its neighbouring types of cavity, pulmonic, nasal, oral, and oesophageal.[8]

My own view is that Pike would have done well to have so defined the pharyngeal cavity as to have excluded the larynx, thus making the pharyngeal cavity entirely supra-laryngeal; for the larynx can easily be distinguished as a physiological unit of cartilage and bone, with its own musculature, enabling it to move upwards and downwards within the pharynx for a distance of approximately two centimetres (Heffner 1952, 25).

The pharynx, on the other hand, is bounded by the tongue (more specifically by the tongue root, or 'radix') as its forward boundary, with the pharyngeal wall as its rearward boundary. As a matter of nomenclature the pharyngeal is the only subcategory of lingual fricative to be named from both its active and passive articulators; for

[8]For purely physiological definitions of the laryngeal pharynx and the oral pharynx cf. Heffner 1952, 25–9; and for the larynx and the pharynx Catford 1977, 20.

the uvular, dental, palato-alveolar, and other lingual fricatives are named after the passive articulator only, the place of articulation. If the rear wall of the pharynx had been distinguished by a term of its own, such as *fauces*, pharyngeal fricatives could have been named faucal fricatives, from the passive articulator, on the same terms as, for example, uvular fricatives and dental fricatives ([χ ʁ θ ð]), or, perhaps, as radico-faucal fricatives, on the same terms as dorso-velar fricatives (cf. Catford 1977 on 'faucal or transverse pharyngeal articulation' as 'the most common articulation of the pharyngeal approximants [ħ] and [ʕ]' (163), and on 'root or radix, which continues on down in front of the epiglottis' (144)). With such a change of name, to faucal or radico-faucal, possibly the pharyngeal sub-category of fricative, [ħ ʕ], would then have been more readily associated with the other sub-categories of lingual fricative, and dissociated from the laryngeal (or glottal) sub-category of fricative, [h ɦ], in the production of which the tongue plays no part; for the friction feature of [h] and [ɦ] is entirely due to the vocal cords within the arytenoid glottis, without distinction of active and passive articulator.

Given such a dissociation of the pharynx from the larynx, laryngeal (and glottal) articulations would not have qualified for inclusion in the pharyngeal cavity; and [ħ] and [ʕ] would be classified as 'pharyngeal cavity' fricatives, while [h] and [ɦ] would be assigned to the pulmonic cavity or to a further, and sixth, cavity, the laryngeal cavity (assuming, that is, that Pike's 'cavity' concept had been retained).

'Pharyngeal air-stream mechanism' My view that the status of the pharynx as a 'cavity', and the relations of the larynx to the pharynx, should be revised would, naturally, affect the name and description of one of Pike's three air-stream mechanisms, the pharyngeal. Since Pike defines the pharyngeal cavity as comprising the pharynx and the larynx as far as, and including, the glottis, the closed glottis as initiator of the 'pharyngeal air-stream mechanism'

lies within the pharyngeal cavity; but if the larynx were to be excluded from the pharyngeal cavity, the initiator of the pharyngeal air-stream mechanism would have to be treated as being either within the pulmonic cavity or within a new cavity, the laryngeal, with the power of moving upwards and downwards within the lower part of the pharynx.

Further, if a pharyngeal cavity were no longer to be distinguished from the oral cavity, the larynx with closed glottis as initiator would be acting not merely on 'pharyngeal cavity' air but on air in a chamber comprising throat and mouth equally, e.g. |pʼ pˤ tʼ tˤ|; and only incidentally would that air chamber be confined to the pharynx, as in the production of a *velar* ejective or injective, |kʼ kˤ|.

In either case the term 'pharyngeal air-stream mechanism' would cease to be appropriate; and Abercrombie's term 'glottalic', from the closed glottis within the larynx acting as initiator, would be preferable (Abercrombie 1967, 28–9).

'Combinations of major air-stream mechanisms' and pharynx air. Those combinations of air-stream mechanisms in which one of the component mechanisms is the pharyngeal would also be affected similarly by a re-consideration of the dimensions of the pharyngeal cavity and of its relations with the larynx; these combinations comprise: 'Pharynx mechanism plus pulmonic mechanism' (95–6), for implosives, e.g. |ɓɠ|, 'oral mechanism plus pharyngeal mechanism' (98–9), for ejective and injective clicks, e.g. |ʗʼ ʘˤ ʗʼ ʘˤ|, and 'oral mechanism plus pharyngeal mechanism plus pulmonic mechanism' (99), for implosive clicks, e.g. |ʗɠ ʗɠ|. Such combinations would be termed glottalic plus pulmonic, velaric plus pulmonic, and velaric plus glottalic plus pulmonic in Abercrombie's analysis, which does not distinguish 'cavities', and treats the pharyngeal fricatives |ħ| and |ʕ| on the same terms as oral fricatives (1967, 126), as they are treated in the I.P.A. chart.

The 'pharyngeal cavity' in the 'pulmonic air-stream mechanism'. Crucial action in the pharyngeal cavity but as part of the more general action of the pulmonic air-stream mechanism would also, of course, be affected by any attempt to restrict the pharyngeal cavity to the pharynx, by excluding that part of the larynx which includes the vocal cords and above, or by a more radical attempt to get rid of the 'cavity' status of the pharynx altogether. Pike describes the pulmonic air-stream mechanism as follows: 'the lungs acting as initiator may press *lung air* outward through the pharynx and mouth or nose (or some connected combination)' (89). Thus, this mechanism takes its name from the lungs as initiator, with due emphasis on lung air; and the crucial role of the larynx in modifying the lung air as it passes, or is prevented from passing, between the vocal cords is somewhat played down. Since Pike treats the vocal cords as part of the pharyngeal cavity, their voicing action, voice vibration versus non-vibration, and their glottal-closure action too, together with glottal friction, |ɦ| and |ɦ̥| (or |W|hisper), are all also to be treated as activities of the pharyngeal cavity; if, on the other hand, the pharyngeal cavity were taken to exclude the larynx, then these glottal activities would become pulmonic-cavity activities (or, possibly, the activities of an independent laryngeal cavity).

The pharyngeal cavity and the 'oral air-stream mechanism'. In my view the larynx and, therefore, the pharyngeal cavity as defined by Pike also function in the 'oral air-stream mechanism' (93–4), thereby calling into question Pike's treatment of this type of air-stream mechanism, e.g. |⊙ ʗ|, as uncombined. He takes voiceless clicks such as 'bilabial egressive click stop' (94), |ʘ̬|, to be examples of the pure 'oral air-stream mechanism', uncombined with any other: 'only sounds produced by oral strictures may occur with this mechanism, since the pharyngeal and nasal cavities are completely outside it (except following velar release); nasalized or voiced types are achieved only in conjunction with the pulmonic mechanism' (93). This restriction results in voiced clicks, e.g. | ʘ͡g ʗ͡g ǀ͡ɡ |, being

classified differently from voiceless clicks, e.g. [⊙ ʗ]: the former are treated as examples of 'oral mechanism plus pulmonic mechanism', a combination of two mechanisms, and the latter as examples of the uncombined, single, or pure 'oral air-stream mechanism', though the only difference between the two types of sound is to be found in the larynx, in its glottal activity.[9] For the former a pulmonic air-stream passes through the narrowed glottis under sufficient pressure to make the vocal cords vibrate; for the latter a pulmonic air-stream passes through the glottis in its wide-open, or breath, position without voice vibration. I see a contradiction in this difference in treatment, and should wish to classify voiceless clicks with voiced clicks as belonging equally to the category of 'oral mechanism plus pulmonic mechanism' (97–8). Indeed Pike himself writes: 'the vocal cords do not, of course, need to be vibrating for these combinations, so that the pulmonic contribution could be voiceless' (98); this would be the case in the production of a voiceless ingressive nasalized click, e.g. [⊙͡ŋ̥ ʗ͡ŋ̥], and should apply equally to a voiceless non-nasalized click, e.g. [⊙ ʗ].

This inconsistency in the treatment of voiced as opposed to voiceless clicks would appear more clearly if the voiceless clicks were to be symbolized as, for example, [⊙͡k ʗ͡k], on the model of the voiced plosive clicks, e.g. [⊙͡g ʗ͡g], and the voiced nasalized clicks,

[9] There are advantages in using Kelly's feature-based symbolization, developed for Xhosa, over the I.P.A. symbolization. In his system these three combinations of symbols would be represented as [ʘʗ] for voiced plosive clicks and with, for example, [ʗ̃] for voiced nasalized clicks; consequently, [⊙ ʗ], for example, can continue to be used for voiceless plosive clicks, and [ʗ̰], for example, could be used for a (voiceless) breathed nasalized click, with [ʗ̤] for a glottal-fricative voiced nasalized click.

An I.P.A. symbol such as [ʗ͡ɡ], for example, symbolizes velar closure twice, once in the click part of the symbol, [ʗ –], and once in the voiced velar plosive part of the symbol, [–ɡ], simply in order to symbolize the feature voice, through [–ɡ].

e.g. |ʗ͡ʢ ʘ͡ʡ|.

If Pike's examples of his 'oral air-stream mechanism', e.g. |⊙ ⊙͡Φ ⊙̂| (cf. 94), were to be reclassified, as I have suggested above, as belonging to the category 'oral mechanism plus pulmonic mechanism' the 'oral air-stream mechanism' category would cease to exist; and only two independent (or uncombined) types of air-stream mechanism would remain, the pulmonic air-stream mechanism and the pharyngeal air-stream mechanism.

2.2 Including the glottis within the 'pharyngeal cavity'

2.2.1 Lingual versus glottal

A major difference between the pharyngeal type of fricative and the glottal is that |ħ| and |ʕ| are lingual fricatives while |h̞| and |h̝| are glottal (and, therefore, laryngeal). In producing the former pair it is the tongue (more specifically, the tongue root, or 'radix'), as active articulator, that approaches the pharynx wall, as passive articulator, sufficiently to give rise to audible friction, while, in producing the latter, the approximating action of the vocal cords within the arytenoid glottis gives rise to the audible friction, without distinction of active and passive articulator.

2.2.2 Phonation

A further major distinction between pharyngeal and glottal fricatives had been to some extent anticipated in Pike 1943: 'oral quality is more basic than pharyngeal quality in that vowel type or timbre persists despite various glottalic or pharyngeal formations' (131). I agree with him as far as glottalic formations are concerned; and I note that all the examples he gives of difficulties that would arise if 'pharyngeal and oral strictures [were] treated as of equal function'

are not pharyngeal but glottal: 'voiceless and voiced [u] would have to be placed in basically different categories instead of being considered varieties of the same vocoid with its form modified by voicing. . . . During a [u], friction at the glottis would leave the sound a vocoid, but labial friction would change it into a contoid' (131).

In Pike's favour one can say that it would certainly be awkward to have to treat vowels accompanied by glottal friction ([V̤]) as contoid rather than vocoid simply because of an undue insistence on friction as a criterion of the contoid category in all circumstances, even when it occurs in the glottis; and the same is equally true, or more so, of whispered vowels ([V̥]). On the other hand I would say that it is just as awkward to have to treat the pharyngeal (and, therefore, lingual) fricatives [ħ] and [ʕ] as vocoids simply because of an undue insistence on friction in the pharyngeal cavity as a criterion of the vocoid category even though this voiceless and voiced pair of fricatives are lingual, just as lingual as [χ ʁ] and [θ ð].

In other words, Pike has anticipated the major phonetic category *phonation* as regards *glottal* fricatives, [ɦ W(hisper)] (141); it is unfortunate that he has blurred the distinction by including them in the same cavity, the pharyngeal cavity, as [ħ] and [ʕ]. Catford 1964, on the other hand, and Catford 1977, define phonation as 'any relevant activity in the *larynx* which is neither initiatory nor articulatory in function' (1977, 16) [my emphasis]. As phonatory stricture types he includes: voiceless, whisper, voice, creak (1977, 95–8; he now excludes, as an 'articulation', or as a 'concomitant of initiation', glottal stop (98); but cf. 1964, 30–3); he also distinguishes four locations: full glottal, anterior (formerly arytenoid), posterior (formerly ligamental), and ventricular (102–4).

Paradoxical though it may seem, my reason for examining Pike's treatment of friction in the pharynx in such detail, and rather critically, in this short tribute to the wide phonetic interests of my former colleague Carnochan, is the very high regard that I have developed

over the years for *Phonetics*, especially when one takes into account its year of publication, 1943, forty-seven years ago, before the instrumental revolution. So sound is it, and so forward-looking, that it irks me to find that it falls short of perfection.

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